

Status of ringed, bearded, spotted, and ribbon seals in Alaska using harvest-based monitoring by decade: 1960s, 1970s, 2000s, and 2010s

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Declines in sea ice are predicted to negatively affect ice seals (ringed, *Pusa hispida*, bearded, *Erignathus barbatus*, spotted, *Phoca largha*, and ribbon, *Histiophoca fasciata*); species important to Alaska Natives for food. Less ice reduces their time to rest, pup, nurse, and molt on sea ice. There are no abundance estimates available to detect population trends; however, data from the subsistence harvest can be used as indices of population health and status. We compare seal growth, blubber thickness, productivity, and proportion of pups harvested during the 2000s and 2010s (years of sea ice decline) to the 1960s and 1970s (before sea ice decline). Pup length by birth year indicated growth has not slowed during most of the recent years; exceptions included bearded seals born in 2018, ringed seals born in 2010 and 2017, and spotted seals born in 2014 and 2015. Blubber thickness was average or above for most years; below average exceptions included 2011 and 2014 for bearded seals, 2010, 2011, 2017, and 2018 for ringed seals, 2017 and 2018 for spotted seals. Below average years for both health indices were often followed by average or above average years. Pregnancy rate during the 2010s was higher for bearded (97%) and spotted (94%) seals than the earlier periods; no periods were statistically different for ringed seals (currently 81%). Ribbon seals had a high pregnancy rate in all decades ($\geq 92\%$). The average age of maturity for bearded seals decreased over time to 2.8 years in the 2010s. In contrast, age of maturity for ringed (3.7) and spotted (3.3) seals in the 2010s was similar to the 1960s and 2000s and lower than the 1970s. Additionally, a relatively high proportion of pups continued to be harvested in the 2010s indicating that pups were being produced, weaned, and surviving to be harvested. Several of our indices suggest a decrease in health in 2010 and 2011, especially for ringed seals, coinciding with the Unusual Mortality Event; followed by a return to average in 2012. Overall, our indices have not detected sustained negative responses in ice seal growth or productivity as predicted with declining sea ice.

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